Figure 3.5: Strong Post W-Beam, G4

Figure 3.6: Thrie-Beam, G9

Figure 3.7: Concrete Safety Shape, CSS

Figure 3.8: Steel-Backed Log Rail, SBL

Figure 3.9: Steel-Backed Timber Rail, SBT

Figure 3.10: Precast Concrete Guardwall, PCG

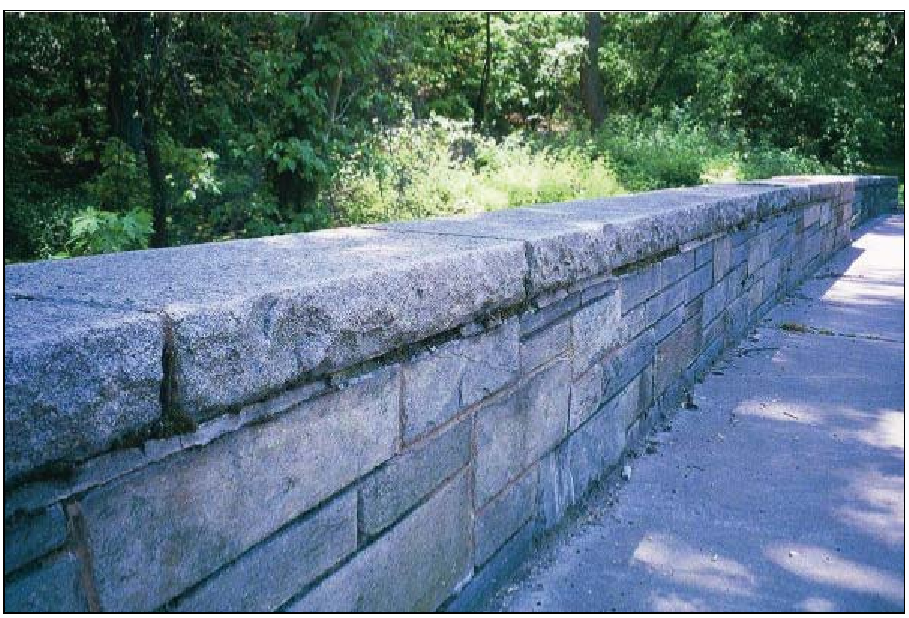

Figure 3.11: Stone Masonry Guardwall, SMG

Figure 3.12: Random Rubble Cavity Wall, RCW

3.2 BARRIER SELECTION

Selection of the most appropriate barrier system for the conditions at a specific site involves the following steps:

1. **Identify special selection issues.** Normal selection issues include costs, maintainability, repair, barrier size, dynamic deflection and available end treatments. At times, however, one of two other issues may be very important:

   a. Aesthetics. Aesthetics of a barrier system may be more important than the cost of the system. There are two aesthetic issues to consider. First is the appearance of the barrier itself. Barriers are available that have a rustic appearance that may be compatible with park and forest settings. Because some of these barriers are considerably more expensive than conventional barriers, their selection may affect the barrier warrant, as discussed in Chapter 2. Second is view obstruction. Some barriers are less obstructive than others.

   b. Severe Conditions. A large percentage of heavy trucks, high frequency of severe crashes and other significant safety concerns may be the overriding issue in some situations.

2. **Determine the design speed.** If the design speed is not known, it is acceptable to use the posted speed. However, it may be appropriate to use the operating speed if the actual speeds exceed the design or posted speeds. Operating speed is usually defined as the 85^{th} percentile speed in free flow conditions. The operating speed can be obtained through a traffic engineering study and can be approximated by driving with free flowing traffic.

3. **Determine the hazard offset.** The hazard offset is the distance between the hazard closest to the roadway and the edge of the traveled way. The hazard offset must allow adequate room for a barrier to be constructed and the dynamic deflection of the barrier system. This issue is most important for hazards that protrude above the ground such as trees and other fixed objects. Barrier offset is discussed in depth in Chapter 4. One of the most important issues in selecting barrier offset is side slope condition. At speeds of 50 km/h (30 mph) or higher, slopes should be 1V: 6H or flatter in front of cable barriers and 1V: 10H for all other barrier systems. At speeds of 40 km/h (25 mph) or less, 1V: 10H slopes are ideal, but all barriers may perform satisfactorily on slopes as steep as 1V: 6H.

4. **Identify technically acceptable barriers.** Tables 3.2, 3.3 and 3.4 provide guidance for the identification of technically acceptable roadside barriers, using the primary design issue, design speed and available hazard offset. All barriers found in the selection tables are crashworthy and are technically acceptable alternatives for the selected conditions of speed and hazard offset.

5. **Select the most appropriate barrier**. The following issues should be considered when selecting the most appropriate barrier from the technically acceptable list:

a. The maintaining agency may have policies concerning barriers that can be used. It is appropriate to restrict barrier types in order to simplify maintenance and minimize the number of spare parts that must be stocked. Barriers not allowed by the maintaining agency should be eliminated, as long as those allowed are non-proprietary.
b. Cost is normally the overriding issue.
c. If aesthetics is a concern but not the overriding issue Table 3.2 can used, with aesthetics as one of the other selection criteria. However, if aesthetics is more of a concern than cost, Table 3.3 should be used, which will restrict consideration to barriers designed for aesthetics or to minimize view obstruction.
d. Ease of maintenance.
e. Safety performance. Generally, barriers with more deflection result in less vehicle damage upon impact.
f. Available end terminals and transitions, if needed.

A barrier must be placed so the hazard is outside the dynamic deflection distance and to allow enough room for the construction of the barrier itself. These factors are included in the minimum barrier – hazard offset, found in the data tables in Appendix B. The larger the minimum barrier – hazard offset, the closer to the traveled way the barrier must be placed.

Barriers placed closer to the roadway must be longer to adequately protect the hazard (see discussion in Chapter 4). Therefore, barriers with larger minimum barrier – hazard offsets will usually have to be longer and thus more costly. As a general rule, the more flexible the barrier system, the lower the cost per foot; but this benefit may be offset by the longer lengths required.

The data tables in Appendix B contain additional information that may be of assistance in barrier selection.

3.3 BARRIER SELECTION TABLES

The following tables can be used to identify technically acceptable barriers, based on the primary design issue, speed and available hazard offset.

Table 3.2: Technically Acceptable Barriers, Normal Conditions

Speed		**Minimum Available Hazard Offset** Meters (Feet)						
Metric	**U.S. Customary**	**0.6 (2)**	**1.0 (3)**	**1.2 (4)**	**1.5 - 2.0 (5 - 6)**	**2.1 (7)**	**2.4 - 3.5 (8 - 11)**	**3.6+ (12+)**
30 - 50 km/h	**20 - 30 mph**	G4 G9	G4 G9	G1 HTC G2 G3 G4 G9	G1 HTC G2 G3 G4 G9	G1 HTC G2 G3 G4 G9	G1 HTC G2 G3 G4 G9	G1 HTC G2 G3 G4 G9
55 - 70 km/h	**35 - 45 mph**	G4[1] G9	G4 G9	G4 G9	HTC G2 G3 G4 G9	HTC G2 G3 G4 G9	G1 HTC G2 G3 G4 G9	G1 HTC G2 G3 G4 G9
80+ km/h	**50+ mph**		G4[1] G9	G4 G9	G4 G9	HTC G3 G4 G9	HTC G3 G4 G9	G1 HTC G3 G4 G9

Notes:
1. Modifications to the G4 system are available to reduce deflection.
2. General note: steel elements in barriers can be supplied with weathering steel, adding an aesthetic element to barriers primarily selected for cost.
3. See Table 3.1 for definitions of acronyms.